



# **Columbia Manufacturing Inc.**

## **Water Conservation Case Study**

### **Plating Operations Achieves Zero Wastewater Discharge**

#### **Summary**

Columbia Manufacturing Inc. in Westfield, Massachusetts eliminated the use of 150,000 gallons of water per day in their plating operations. Columbia saved \$80,000 in sewer fees, among other cost savings, by upgrading the plating equipment and integrating a zero discharge wastewater treatment system. The new, efficient plating line enables the company to recover and reuse 98% of the plating chemistry resulting in a drastic reduction of hazardous waste generation.

#### **Background**

Columbia Manufacturing Inc. has operated at its Westfield, Massachusetts facility since 1877 and currently has a workforce of 125 employees. Originally a bicycle manufacturing company, now Columbia is the second largest manufacturer of school furniture in the nation, producing items such as student desks, tables, and chairs.

The school furniture manufactured at Columbia is made from tubular steel that is bent and welded into various configurations, plated, and then completed with the attachment of the seat or desktop. The product is difficult to plate because of its size, various configurations, and tubular construction.

#### **Water Conservation**

Due to a growing demand for their product and to the fact that about 90% of the furniture they manufacture is chrome plated, Columbia needed to expand and upgrade its antiquated plating line. Hindering their ability to remain competitive was a nickel-chrome plating line that was slow, inefficient and costly to operate. The production line lacked counter flow rinses and used about 150,000 gallons of water per day. The wastewater treatment system, used to treat the waste rinse water prior to discharge, was also an inefficient use of raw materials, which presented a great liability and added expense to the company.

Columbia used a facility wide approach to modernize and expand its nickel-chrome plating line. The company sought systems that could expand production capacity while reducing water use, chemical and labor costs, and the generation of hazardous waste and wastewater. The company decided on a special racking system combined with a new Napco automated nickel-chrome plating line and a CASTion zero-discharge resource recovery system. This new line tripled the company's plating capacity and minimized waste generation.

The reformatted plating operation integrated a new plating line, with drag out recovery and counter flow rinse tanks, and three CASTion vacuum distillation units for treating each of the segregated rinse water streams from the cleaner/acid line, nickel plating line, and chromium plating line.

Water from all three vacuum distillation units is run through an ion exchange system with the following steps: ultra filtration, granular activated carbon, ion exchange, final filtration and ultraviolet sterilization.

The resulting de-ionized (DI) water is reused on the plating line, resulting in a closed loop process where all industrial wastewater discharges are eliminated to the sewer.

Approximately 98% of both the nickel and the chromic acid is recovered from the rinse waters and concentrated for reuse in the plating tanks. The savings from the recovery and reuse of chromium trioxide is 600 pounds per week. The concentrated waste from the treatment system goes to a filter press where the resulting waste cake is then properly disposed. Water is added to the system only to make up for evaporation from the tanks. Columbia is now exempt from air and water discharge permits and from RCRA hazardous waste TSDS permits because of the zero-discharge system.

## Results

*Reductions:* Columbia eliminated the use of 150,000 gallons per day of water and no longer generates 130,000 gallons per day of wastewater from the new plating processes. All of the wastewater is recovered as DI water and used in the rinse baths. As for the plating chemistry, approximately 98% of the nickel and chromic acid plating chemistry is recovered and reused. As a result, the company also reduced use of chromium trioxide by more than 31,000 pounds per year.

*Economics:* Columbia spent a total of \$850,000 for the new closed loop waste treatment system, including installation. An additional expense was the need to install two new gas-fired boilers to handle the increased energy need required by the CAST-ion system. The overall return on investment on the CASTion system was less than two years. There is a yearly savings of \$80,000 in sewer fees from the lack of wastewater generated from the plating process. Additional cost savings are achieved from reductions in chemical and water use and hazardous waste generation, and elimination of environmental permit fees.

This case study is one in a series prepared by the Office of Technical Assistance (OTA), a branch of the Massachusetts Executive Office of Environmental Affairs. OTA's mission is to assist Massachusetts facilities with reducing their use of toxic chemicals and/or the generation of toxic manufacturing byproducts. Mention of any particular equipment or proprietary technology does not represent an endorsement of these products by the Commonwealth of Massachusetts. This information is available in alternate formats upon request. OTA's **non-regulatory** services are available at **no charge** to Massachusetts businesses and institutions that use toxics. For further information about this or other case studies, or about OTA's technical assistance services, contact:

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